NETWORK TRANSCEIVERS - MEMORY UPGRADES

**J9150A-AO**
10Gbase SFP+ Transceiver

## Features

- Compliant to SFP+ Electrical MSA SFF-8431
- Compliant to SFP+ Mechanical MSA SFF-8432
- Multi-rate compliance for Ethernet and Fiber Channel
- Transmission distance up to 300m (OM3 fiber)
- Sub watt power consumption: 0.65W (typ.)
- 0°C to +70°C case operating temperature range
- Laser Class 1 IEC / CDRH compliant
- RoHS 6/6 compliant
- Compliant with product safety standards

## Product Description

The J9150A-AO is a multipurpose multi-rate optical transceiver module for transmission at 850nm over multimode fiber. Supporting Ethernet and Fiber Channel standards make it ideally suited for 10GB data communication and storage area network applications.
Its sub watt power consumption and its excellent EMI performance allow system design with high port density. The small form factor integrates an 850nm vertical cavity surface emitting laser (VCSEL) in an LC package and a PIN receiver. Addon Computer Peripheral's module is lead free, RoHS compliant and is designed and tested in accordance with industry safety standards.

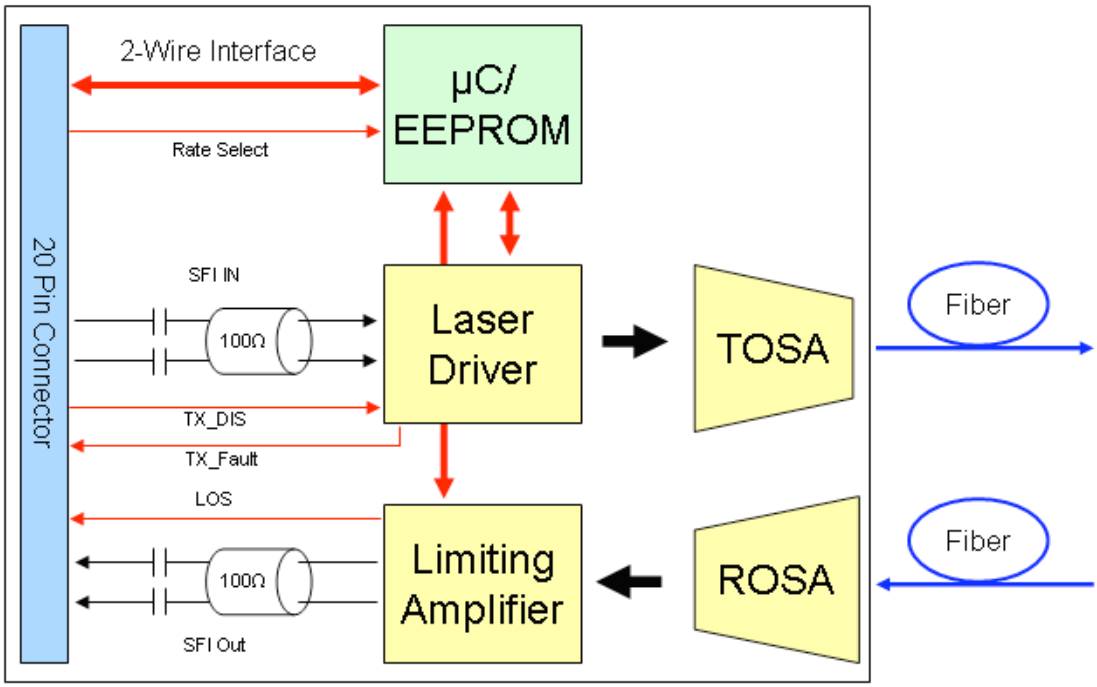
## Functional Description

The Transceivers convert information from electrical to optical format, and back again, at different data rates depending upon the chosen standard. The transmit path consists of an AC coupled 100 ohm differentially terminated driver coupled to a highly reliable 850nm VCSEL. The laser output may be disabled by pulling the TX_DISABLE line high. The laser is also disabled if this line is left floating, as it is pulled high inside the transceiver. The SFP+ MSA (Multiple Source Agreement) defines two RATE_SELECT lines, one for the transmitter (pin 9) and one for the receiver (pin 7). Depending upon the transceiver application, the transmitter RATE_SELECT line can switch between1 GBd and 10 GBd.

The receiver path consists of a ROSA (receiver optical sub-assembly) for optical electrical conversion, followed by a limiting amplifier to boost the electrical signal. A LOSS_OF_SIGNAL (LOS) status line is provided to facilitate easy link detection. Depending upon the transceiver application, optimum receiver bandwidth may be configured using the receiver RATE_SELECT pin: for Ethernet applications to switch

between 1 GBd and 10 GBd data rates, and for Fiber Channel applications switch ≤/> 4 GBd data rates.

Not all transceiver versions require RATE_SELECT.



## Electrical Characteristics Absolute Maximum Ratings

| Rating | Conditions | Symbol | Min | Max | Units |
|---|---|---|---|---|---|
| Storage Ambient Temperature Range | | Jstg | -40 | +85 | °C |
| Powered Case Temperature Range | | Jc | 0 | +75 | °C |
| Operating Relative Humidity | Non condensing | RH | 0 | 95 | % |
| Supply Voltage Range @ 3.3V | | VCC3 | -0.5 | 3.6 | V |
| Open Drain VCC Level | | VOD | | 4.0 | V |
| Static Discharge Voltage Speed Pins on High | HBM human body model per JEDEC JESD22-A114-B | | | 1 | kV |
| Static Discharge Voltage excluding High Speed Pins | HBM human body model | | | 2 | kV |
| Static Discharge Voltage Module on SFP+ | EN61000-4-2 Criterion B: Air Discharge Direct Contact discharge | | | 15<br>8 | kV |

Any stress beyond the maximum ratings may result in permanent damage to the device. Specifications are guaranteed only under recommended operating conditions.

## Recommended Operating Conditions

| Parameter | Conditions | Symbol | Min. | Typical | Max. | Unit |
|---|---|---|---|---|---|---|
| Operating Case Temperature | altitude of < 3km | JCase | 0 | | +70 | °C |
| Power Supply Voltage@3.3V | | Vcc3 | 3.135 | 3.30 | 3.465 | V |
| DC Common Mode Voltage | | Vcm | 0 | | 3.6 | V |

## Low Speed Characteristics

| Parameter | Conditions | Symbol | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Supply Current Transmitter | @ VCCTX | IVCCTX | | | 120 | mA |
| Supply Current Receiver | @ VCCRX | IVCCRX | | | 125 | mA |
| Power Consumption | | | | 0.65 | 1 | W |
| TX_Fault, RX_LOS | Host Vcc Range 2V – 3.47V | VOL | 0 | | 0.4 | V |
| | | VOH | Host_ Vcc – 0.5 | | Host_ Vcc +0.3 | |
| TX_Dis, RS0, RS1 | Low Voltage TTL | VIL | -0.3 | | 0.8 | |
| | | VIH | 2.0 | | VccT +0.3 | |
| SCL, SDA | Host Vcc Range | VIL | -0.3 | | VccT*0.3 | |
| | 3.14V – 3.47V | VIH | VccT*0.7 | | VccT +0.5 | |
| | | VOL | 0.0 | | 0.4 | |
| | | VOH | Host_ Vcc – 0.5 | | Host_ Vcc +0.3 | |

| Parameter | Conditions | | Symbol | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| Supported Data Rate | | | VID | 1 | 10.3125 | 11.3 | Gbd |
| Reference Differential Input Impedance | | | Zd | | 100 | | Ω |
| Input AC Common Mode Input Voltage | | | | 0 | | 25 | mV (RMS) |
| Differential Input Voltage Swing | | | VID | 150 | | 900 | mV |
| Differential Input S-parameter | 0.01 – | 3.9GHz | SDD11 | | | -10 | dB |
| | 3.9 – | 11.1GHz | | 1) | | 1) | dB |
| Differential to Common Mode Conversion 2) | 0.01 – | 11.1Ghz | SCD11 | | | -10 | dB |
| Total Jitter | | | TJ | | | 0.28 | UI(p-p) |
| Data Dependant Jitter | | | DDJ | | | 0.1 | UI(p-p) |
| Uncorrelated Jitter | | | UJ | | | 0.023 | RMS |
| Eye Mask | See SFP+ MSA | | X1 | | | 0.14 | UI |
| | | | X2 | | | 0.35 | UI |

## SFI Module Receiver Output Characteristics

| Parameter | Conditions | Symbol | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Supported Data Rate | | | 1 | 10.3125 | 11.3 | Gbd |
| Reference Differential Output Impedance | | Zd | | 100 | | Ω |
| Termination Mismatch | | Δ Zd | | | 5 | % |
| Output AC Common Mode Output Voltage | | | | | 15 | mV (RMS) |
| Differential Output Amplitude | RLoad=100Ohm , Differential | VOSPP | 350 | 650 | 800 | mV |
| Output Rise and Fall time | 20% to 80% | tRH, tFH | 24 | | 35 | ps |
| Differential Input S-parameter | 0.01 – 3.9GHz | SDD22 | | | -10 | dB |
| | 3.9 – 11.1GHz | | | | 1) | dB |
| Common Mode Output Return Loss2) | 0.01 – 6.5Ghz | SCC22 | | | -7 | dB |
| | 6.5 – 11.1Ghz | | | | -3 | dB |

1) Return Loss given by equation Sxx22(dB) = -8+13.33 Log10(f/5.5), with f in GHz;
2) Common mode reference impedance is 25Ω. Common mode return loss helps absorb reflection and noise improving EMI.

## Optical Characteristics
## General Parameters

| Parameter | Conditions | Bandwidth Min Modal (MHz*km) | Symbol | Min | Typical 1GBd | Typical 10GBd | Units |
|---|---|---|---|---|---|---|---|
| Operating Range | 62.5 µm MMF<br>50 µm MMF<br>62.5 µm MMF<br>50 µm MMF<br>50 µm MMF | 160<br>400<br>200<br>500<br>2000 | lOP | 2<br>2<br>0.5<br>0.5<br>0.5 | 220<br>500<br>275<br>550<br>X | 26<br>66<br>33<br>82<br>300 | m |

## Optical Transmitter

| Parameter Optical Transmitter | Conditions | Symbol | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Nominal Wavelength | | λTPΠ | 840 | 850 | 860 | nm |
| Spectral Width | Fiber Channel version | Δλ | | | 0.65 | |
| | Ethernet version | | | | 0.45 | |
| Average Launch Power | | Pavg | -7.3 | | -1 | dBm |
| Average Launch Power | Fiber Channel version | POMA | -5.2 | | | |
| | Ethernet version | | -4.3 | | | |
| Extinction Ratio | | ER | 3.5 | | | dB |
| | Ethernet 1.25GBd | | tbd | | | |
| Relative Intensity Noise | | RIN | | | -128 | dB/Hz |

## Optical Receiver

| Parameter | Conditions | Symbol | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Maximum Input Power | | PMAX | | | -1 | dBm |
| Center Wavelength | | λX | 840 | 850 | 860 | nm |
| Receiver Sensitivity Ethernet | Pavg, PRBS $2^{31}$-1, BER < 1*10-12@ 1.25GBd *) | PIN | tbd | | | dBm |
| | OMA, PRBS $2^{31}$-1, BER < 1*10-12@10.3125GBd | | -11.1 | | | |
| Receiver Sensitivity Fiber Channel | OMA, PRBS $2^{31}$-1, BER < 1*10-12@2GBd | | -13.0 | | | |
| | OMA, PRBS $2^{31}$-1, BER < 1*10-12@4GBd | PIN | -12.0 | | | dBm |
| | OMA, PRBS $2^{31}$-1, BER < 1*10-12@8GBd | | -11.2 | | | |
| | OMA, PRBS $2^{31}$-1, BER < 1*10-12@10GBd | | -11.1 | | | |
| Stressed Receiver Sensitivity Ethernet | OMA, PRBS $2^{31}$-1, BER < 1*10-12@1.25GBd | PIN | tbd | | | dBm |
| | Pavg, PRBS 231-1, BER < 1*10-12@ 10.3125GBd | | -7.5 | | | |
| Stressed Receiver Sensitivity Fiber Channel (OM3 fibers) | OMA, PRBS $2^{31}$-1, BER < 1*10-12@2GBd | | -10.8 | | | |
| | OMA, PRBS $2^{31}$-1, BER < 1*10-12@4GBd | PIN | -9.0 | | | dBm |
| | OMA, PRBS $2^{31}$-1, BER < 1*10-12@8GBd | | -8.3 | | | |
| | OMA, PRBS $2^{31}$-1, BER < 1*10-12@10.3125GBd | | -17.5 | | | |
| Loss of Signal | | Pav_as | -30 | | | dBm |
| | | POMA_deas | | | -12 | |
| | Ethernet:1.25GBd *) | Pav_deas | | | -17 | |

## Digital Optical Monitoring

Transceivers offer the ability to monitor important module parameter during operation. The five parameters listed below are continuously monitored for getting information about the current module status. All data is calibrated internally; there is no need for external post processing.

**Temperature**

Internally measured temperature data is represented as two's complement of a signed 16-bit value in increments of 1/256 °C over a range of -40 to +100°C. Accuracy is better than +/-3%.

**Supply Voltage (VCC)**

Internally measured supply voltage. Represented as a 16-bit unsigned integer with the voltage defined as the full 16 bit value (0 – 65535) with LSB equal to 100 µVolt, which yields to a total range of 0 to +6.55 Volts. Accuracy is better than +/-3%.

**Laser Bias Current**

VCSEL bias current. Represented as a 16 bit unsigned integer with the current defined as the full 16-bit value (0 – 65535) with LSB equal to 2 µA, valid range is 0 to 20 mA. Accuracy is better than +/-10%.

**Optical Transmitter Power**

TX output power measurement is based on internal monitor diode feedback. Represented as a 16-bit unsigned integer with the power defined as the full 16 bit value (0–65535) with LSB equal to 0.1µW. Accuracy is better than +/-3dB over a range of Pavmin to Pavmax.

**Receiver Optical Power**

RX input power measurement is based on photodiode diode current. Represented as a 16-bit unsigned integer with the power defined as the full 16 bit value (0 – 65535) with LSB equal to 0.1 µW. Accuracy is better than +/-3dB over a range of -12dBm to -1dBm. Note: The specified characteristics are met within the recommended range of operating conditions regarding temperature and voltage.

## Regulatory Compliance

## Module Safety

Addon Computer SFP+ modules are designed to meet international requirements and standards in terms of product safety. Tests were performed according to IEC 60950-1:2001 (CB scheme).The module is RoHS compliant according to the European Parliament requirements on the restriction of the use of hazardous substances in electrical and electronic equipment (RoHS). The modules optical output power meet Class 1 requirements for laser safety.

| Requirements | Standard | Status |
|---|---|---|
| Module Safety | IEC 60950-1:2001 EN 60950-1:2001 | TUV Report / Certificate available CB Report / Certificate available |
| RoHS | RoHS Directive 2002/95/EC | RoHS 6/6 compliant Certificate of |
| Compliance | Amendment 4054 (2005/747/EC) | compliance available |
| Laser Eye | CDRH 21 CFR 1040.10 and | Laser Class 1 according to FDA |
| Safety | 1040.11 IEC 60825-1 Rev2 2007 | Laser Class 1 according to IEC Rev2 |

## ESD & Electromagnetic compatibility

Addon Computer SFP+ modules are designed to withstand high ESD voltages. Its excellent performances in terms of EMI allow system designers to integrate the module in high density applications.

| Requirements | Standard | Status |
|---|---|---|
| Electro Static Discharge to the Electrical Pins (ESD) | EIA/JESD22-A114-B MIL-STD 883C Method 3015.7 | Exceeds requirements Class 1B (>1000V) |
| | | Exceeds requirements |
| Immunity to ESD | IEN 61000-4-2 | Discharges ranging from 2kV to |
| (housing, receptacle) | IEC61000-4-2 | 25kV without damages to the |
| | | transceiver |
| Electromagnetic | FCC Part 15, Class B EN | Exceeds requirements Class B |
| Emission (EMI) | 55022 Class B CISPR 22 | with more than 6dB margin |

## Contact Information

Add-On Computer, Inc. is a leading supplier of Memory Upgrade, Network Transceivers and Network connectivity products to Channel Partners, Resellers and OEMs, with more than seventeen years of direct industry experience. Add-On Computer (ACP) has been the exclusive supplier to Ingram Micro's "Memory Upgrades" program for the past nine years.

Add-On Computer maximizes profitable opportunities for our partners. Our ability to source product worldwide, ensures that our pricing will always be competitive. Offering turnkey solutions, Add-On Computer has forged a reputation as a solutions provider, delivering high quality, cost effective product in a timely and reliable manner.

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